Situational Awareness Strategies for Autonomous Systems in Dynamic Urban Environments
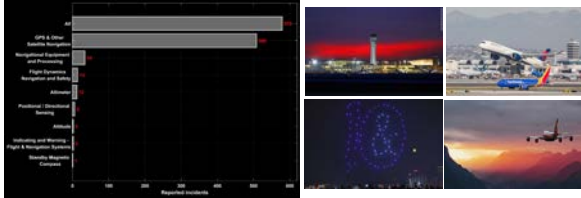
Zak M. Kassas, The Ohio State University
https://ece.osu.edu/aspin

Aviation Safety Reporting System

Objective:

- Develop radio SLAM: a GPS-less reliable and accurate autonomous navigation system, exploiting ambient terrestrial signals

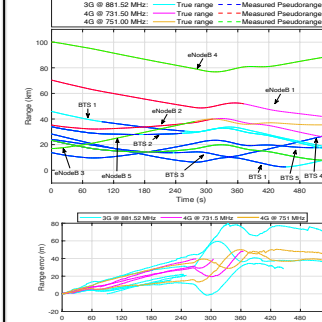- Demonstrate radio SLAM on high-altitude US Air Force aircraft

SNIFFER: Signals of opportunity for Navigation In Frequency-Forbidden EnviRonments
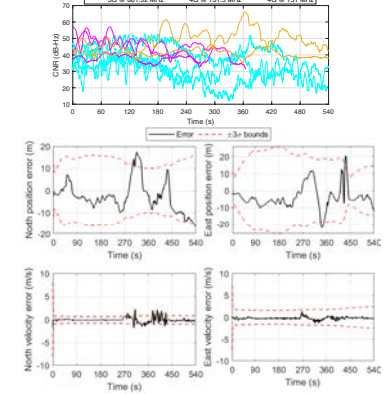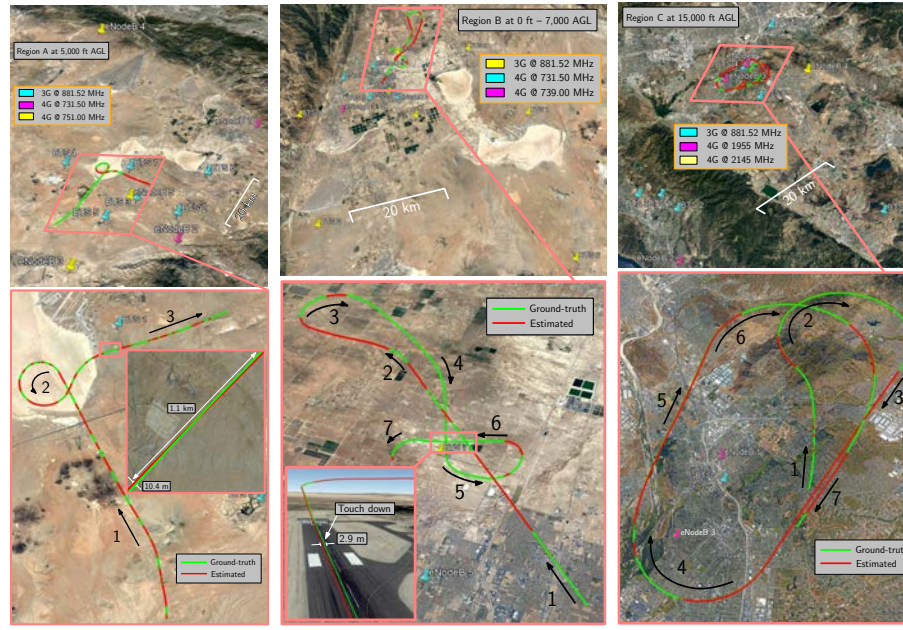

Flight Regions and Trajectories

Ranging Results
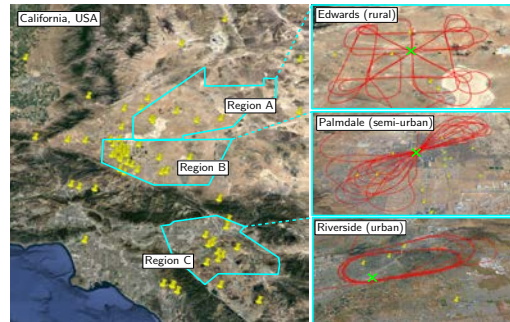
Navigation Results

Tracking Results

NAVIGATION PERFORMANCE WITH CELLULAR SIGNALS

Metric	Region A	Region B	Region C
Cellular towers {3G, 4G}	{6, 5}	{9, 5}	{7, 4}
Cellular frequencies (MHz)	881.52	881.52	881.52
	731.5	731.5	1955
	751	739	2145
Flight duration (mins)	9	11	8.5
Flight length (km)	51	57	55
Altitude AGL (ft)	5,000	0 – 7,000	15,000
Position RMSE (m)	10.53	4.96	11.67
Velocity RMSE (m/s)	0.58	0.50	0.71
Maximum position error (m)	22.67	15.04	25.89
Maximum velocity error (m/s)	2.29	3.19	3.94

Game of Drones

THE OHIO STATE UNIVERSITY

U.S. AIR FORCE